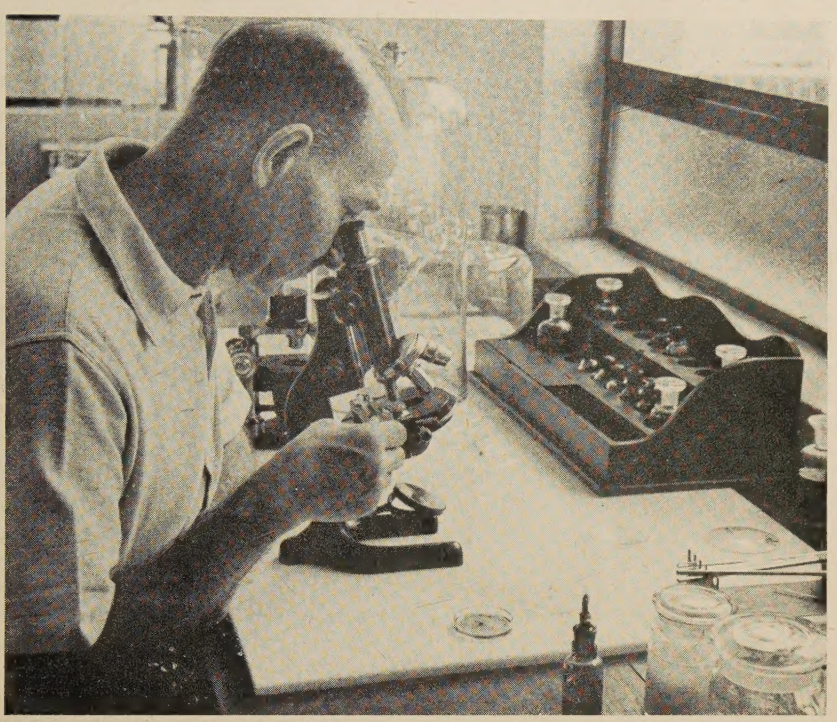
THE RUBBER RESEARCH INSTITUTE OF MALAYA'S

PLANTERS' BULLETIN



NEW SERIES NUMBER THREE

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R R I

LOCATION The Institute's Laboratories and Offices are at the third mile, Ampang Road, Kuala Lumpur.

CORRESPONDENCE All *letters* must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special inquiries may be marked for the attention of a particular officer, if so desired (See Staff List in Bulletin No. 1, page 24). The address for *telegrams* is Searching, Kuala Lumpur. *Telephone:* Kuala Lumpur 3351/2/3. *Parcels* occasionally arrive without any indication of their origin. It is requested that senders will write their names and addresses clearly on the outside of all packages, and also advise the Institute by letter or telegram of their despatch This is especially important for perishables, such as latex samples and plant specimens.

PROHIBITED PLANT SPECIMENS Attention of planters and others in territories outside the Federation of Malaya and the Colony of Singapore is drawn to the Malayan Plant Importation Rules which prohibit the importation into Malaya of any part of a plant, whether living or dead, unless it is accompanied by a permit issued by the Director of Agriculture, Federation of Malaya. No permit will be issued in respect of any diseased plant or any plant pest. Any plant imported in contravention of these Rules (whose object is to prevent the introduction of diseases or pests) will be destroyed without examination. Anyone outside Malaya who desires our advice on pests or diseases or any other matters that may require examination of living material must first submit an inquiry by letter giving the fullest possible description of their problem.

ADVICE Inquiries are invited from rubber producers in the Federation of Malaya, the Colonies of Singapore and North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. *Interviews* should be arranged by letter or telephone, as members of the senior research and advisory staff are frequently absent on visits to plantations. The Institute is open from 8 AM to 1 PM and 2 PM to 4 PM on Mondays to Fridays, and from 8 AM to 12.30 PM on Saturdays.

EXPERIMENT STATION AND FACTORY This station of the R R I is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement with the Director of the Rubber Research Institute (see *Correspondence* above). There is a guest house.

THE RUBBER RESEARCH INSTITUTE OF MALAYA'S

PLANTERS' BULLETIN

Kuala Lumpur November 1952 New Series No. 3

Editorial: The Pathological Division

By offering articles on pests and diseases of the rubber tree—the province of the Pathological Division—this issue of the *Planters' Bulletin* follows the plan of the two earlier numbers in the new series, which were devoted to botanical and chemical subjects respectively. The ways in which the plant pathologist can help the planter, and *vice versa,* are brought out in our second article, in which the misfortunes of an imaginary estate are recounted. Mutual assistance is indeed essential to our work, and in this issue we shall strive to bring closer to the planting community the people whose business it is to offer them technical advice. Incidentally one difficulty which is often encountered by the specialist is that he is called upon to offer advice on quite inadequate information. It is with the view to overcoming this that the reader will find a note on the sending of pathological specimens, explaining the sort of information we want with them.

During July Rubber Research workers from Ceylon, Indochina, Indonesia and Malaya met together at Bogor in West Java, to discuss research reports and exchange views. It was a most successful meeting, and showed the value of contact between workers in the same scientific fields. An account of the papers on pests and diseases presented there is included in this issue.

We are glad also to be able to include a note on Electrical Fencing, for which we are indebted to the retiring Chief Game Warden of the Federation, Mr A.H. Featherstonhaugh. His practical advice will be welcomed on many an outlying estate, particularly now that the Emergency rules out most other ways of dealing with intruding big game.

Few reading the article on South American Leaf Blight will doubt the importance of taking steps to protect the country from this most destructive disease. Little has been written on the subject, but much has been done, largely through the foresight and initiative of Mr R.A. Altson, the recently retired Head of the Pathological Division and the microscopist of our cover photograph. The death of both Mr F. Beeley and Mr R.P.N. Napper, both war casualties, left a void that we were fortunate in finding Mr Altson to fill; his work has laid a sure foundation on which the future can build. In recording the departure of this most valued and senior member of the staff, it is pleasant to recall his services to the Rubber Research Institute and to the planting industry. He came to us in 1946, bringing with him a wide experience of tropical plant pathology gained in the course of many years in the Colonial Agricultural Service, first in British Guiana, then in Malaya. In leaving us, Mr Altson is not severing his connection with plant pathology but is extending the field of operations in an appointment with the Commonwealth Mycological Institute, in which we wish him every success.

South American Leaf Blight

AS ITS NAME IMPLIES, South American Leaf Blight, caused by the fungus *Dothidella ulei*, is indigenous in the original home of the *Hevea* rubber tree—in the valleys and surrounding hills of the Amazon and its tributaries. On the scattered trees in the Amazonian jungle the disease is not particularly noticeable, but it has shown itself to be devastating whenever an attempt has been made to establish plantations within the range of the fungus. Its ravages were responsible for the collapse of a plantation industry launched in the Guianas in the first decade of the century, and later for the failure of earlier attempts by the Ford and Goodyear Companies to cultivate rubber in South and Central America. Wherever *Hevea* has been taken in tropical America the disease has followed; and it was only with the spur of the acute wartime shortage of natural rubber that special measures have been taken to make rubber cultivation possible there.

The defence against the fungus in the war now being successfully waged by the Latin Americans in collaboration with the United States Department of Agriculture is based on natural resistance, which has shown itself in some trees of the wild population. To grow a stand of high yielding rubber it is necessary to base bud with a good Eastern clone, then top bud with a resistant crown. Until the high budding is accomplished the young tree is vulnerable to blight, and requires the protection of regular spraying with a fungicide. Thus, the production of a three piece tree is a costly process.

As far as is known the entire population of *Hevea brasiliensis* in the East is susceptible to the disease. Thus it is a matter of the first importance to the rubber growing industry that *D. ulei* should never become established here. The ever increasing volume and speed of air services inevitably enhance the risk of a chance infection being introduced, so that it is no longer sufficient to rely on the remoteness of the source of infection and on the sea as a barrier.

In 1948 the Head of the Pathological Division drew attention to the danger, and pointed out the three following ways in which it should be countered:

(*i*) by the introduction of legislation governing the importation of planting material, to provide safeguards against entry of the disease;

(*ii*) by the acquisition of resistant planting material;

(*iii*) by the development of measures designed to eradicate the disease should it gain entry into the country.

It is at once apparent that the first is the most important, not only because it alone can immediately be put into effect, but also because it would be infinitely cheaper to prevent the introduction of the disease than to deal with it after it had arrived. The second line of defence, which is the most positive, would take many years to become fully effective; and the last, however carefully planned, would always be somewhat problematic. All three lines have received active attention, and progress has been made.

Stunted thirteen year old trees of mixed eastern clones growing in South America. The trees in the back-ground have been top budded with blight resistant crowns.

POSITION IN MALAYA

The legal position in Malaya is that no plant may be imported by air (with the exception of fresh fruit and vegetables from Australia), that no plant may be imported from Tropical America unless under most strictly controlled conditions, and that no rubber planting material may be imported from anywhere except by the Director of Agriculture, who will ensure that adequate precautions are taken. For rubber from an area where *Dothidella* occurs the safeguards include passage through intermediate quarantine outside the tropics, in just the same way as the original introduction of rubber to the Orient was made. It was indeed most fortunate that shipping facilities available to Wickham in 1876 obliged him to take his seed to England, where it was germinated before being sent on. Thus the original eastern planting material, as well as a few later and smaller introductions, were subjected to an ideal form of quarantine.

One thing is certain from the record of *Dothidella* in South and Central America—should it gain access to any part of South East Asia its spread to Malaya would only be a question of time. It is not enough, therefore, to take steps to prevent the disease being introduced into this country; similar steps must be taken by all countries in the region. It was from proposals to this effect that a South East Asia Phytosanitary Conference was convened in Singapore early in 1949. Discussion ranged over many problems, but *Dothidella* was recognised as the chief one. While no permanent form of agreement or convention has yet arisen from the recommendations of the conference, progress has been made in bringing diverse phytosanitary legislation into more accord with current needs.

For resistant planting material we are dependent on our opposite numbers in America, not only because resistance has yet to be detected in any eastern material, but because (not having the disease) we would be unable to recognise resistance if it were present. It is therefore a matter of great satisfaction that, following a visit to Brazil by the Head of the Pathological Division in 1950, the Director of the Instituto Agronomico do Norte agreed to supply selected resistant material in exchange for planting material required there. The Rubber Plant Investigations Division of the U.S. Department of Agriculture are assisting in the exchange by extending to us the facilities of their quarantine station at Coconut Grove, Florida.

MEETING THE THREAT

Each year since 1948 the problem of finding a method by which South American Leaf Blight might be eradicated has formed part of the Pathological Division's research programme. It was decided from the outset that the only technique holding promise of success in mature rubber was the dissemination of a defoliant from the air. The first step was to find the best material to use, and after prolonged trials with nursery plants the herbicide decided on was the normal butyl ester of 2,4,5 trichlorphenoxyacetic acid (2,4,5 - T) dissolved in Shell Diesoline. The next major decision concerned the type of aircraft, and here we were fortunate in that de Havilland Beavers brought in for operation in the Federation Air Service promised to be very suitable. The first trials have now been completed, using standard Beaver spray gear fitted to a chartered plane. It has been shown that the method works, and we now have some information as to the quantities and concentrations necessary. The inquiry does not rest here; next year we intend to investigate other practical aspects of the problem, and when they are solved we shall have to arrange for the requisite stores to be held in readiness against the day (which we hope will never come) when *Dothidella ulei* is recognised in this country.

RECOGNITION

How is it to be recognised? It is clearly impossible for officers of the Pathological Division to be constantly searching for the disease. The annual crop of secondary leaf fall specimens which we receive might suddenly reveal its presence, but it is more likely that the first indication would have to come from the planter himself. To enable him to recognise the disease, and to distinguish it from fungal infections already here, we are planning an illustrated leaflet with coloured plates and brief descriptions of the different stages of South American Leaf Blight. Thereafter we must rely on the close observation and speedy advice of the man on the spot to bring a suspected outbreak to our notice, so that the eradicant measures which we are preparing might be given a chance. The speed with which a campaign of eradication could be instituted would be a major factor in its success; therefore it is necessary in the public interest that the Department of Agriculture, on whom responsibilty for the operation would fall, should be able to take the necessary action immediately. It will indeed be a bleak prospect for the industry, and even for the country as a whole, if the disease were to be allowed to spread unchecked.

PATHOLOGICAL DIVISION

Province of the Pathological Division

CHENDAWAN LAPOK ESTATE has always been well managed. It has planted good clonal material, has been liberal in manuring the land, and has an up to date factory. Yet it is by no means a successful estate; perhaps because it is situated in one of the wettest parts of the country, is low lying, has jungle on two sides and poor kampong rubber on the other boundaries. The trees refuse to remain healthy on this estate, but the management does believe in consulting the Rubber Research Institute and consequently we learn more from Chendawan Lapok than from all the other estates put together—information that is of considerably value to the industry as a whole.

Consider the part played by the Pathological Division in advising Chendawan Lapok on their replanted area over a period of thirty years. The affairs of the Estate will be the part concern of all the graduate officers of the Division. The Entomologist and Assistant Entomologist deal not only with insects, as their title would imply, but with every animal pest from a mite to an elephant. The Pathologist and Assistant Pathologist are concerned with fungi (only a few of which present themselves in the form of the familiar mushroom or bracket fungus), with bacteria, and with any virus disease that might appear. The Field Research Officer plans the large field trials of treatments, upon which the advice given to estates is based. These trials may be laid down on the Institute's Experiment Station, or on cooperating estates. The Head of the Division coordinates the work of the above officers; he must also deal with matters connected with protecting the industry from dangerous diseases from overseas. Even Chendawan Lapok manages eventually to produce a profitable crop, but it might be a different story if one of the diseases from other rubber growing countries entered Malaya, and was not successfully eradicated.

DIRECTORS DECIDE ON A REPLANTING

The thirty years opens with the decision of the Board of Directors of Chendawan Lapok to replant the old seedling areas. The advice of the Pathological Division is sought on whether to grub out the old trees, and if so what mechanical methods to use to reduce the root disease hazards. Alternatively, whether to fell and poison the stumps, and if so what method of poisoning will lead to the most rapid death of the roots consistent with economy of the arsenite. The recommendations (some of which are published as Circular 36) are based on pre-war experiments and on two large experiments laid down in 1950 and 1952. On the grounds of initial saving the directors elect to stump poison and risk subsequent root disease losses.

A nursery is established near the area but heavy losses are suffered from wild pig; information on poison baits and electric fencing has to be obtained. Soon the leaves of surviving plants are seen to be heavily spotted and shrivelled, diagnosed to be the result of Bird's Eye Spot and mite attack respectively. Sulphur dusting is recommended against the mites but not against the fungus. Indeed, a great deal of time has been spent on testing sulphur and many other fungicides for their efficacy against Bird's Eye Spot, but all have proved valueless. This information has been worth obtaining as it saves time and money being wasted on vain attempts at fungicidal control of this disease. Eventually buddings are made and planted out as budded stumps.

The young buddings in the wetter parts of the field begin to die back after shooting, and to show target like spots on the leaves identified as due to *Colletotrichum ficus*. Improved drainage ameliorates this condition, but cannot prevent die back by a related fungus, *Gloeosporium alborubrum*, against which spraying with a copper fungicide is resorted to. Work has been continuing on these fungi for a number of years.

COVER CROP With the budded stumps planted out it is time for establishing a leguminous cover crop, and the estate calls for cultures of *Rhizobium* with which to inoculate the seed. This we are able to supply, having isolated a strain of *Rhizobium* which will nodulate equally well on both the *Centrosema* and *Calopogonium* which they have chosen. At this time sodium arsenite is brought into use to keep back excessive growth of the natural cover in another part of the replanting. A few weeks later a number of the rubber plants in this area begin to die and specimens are sent in; it is confirmed by analysis that the trees have been poisoned by careless application of the arsenical spray.

A more serious outbreak of dying trees occurs in the second year of the plantation's life. It is found to be White Root Disease caused by the fungus *Fomes lignosus*, and collar inspection is recommended to determine the extent of infection. Although digging out the sources of infection is the only method of eradication known at present, some fundamental work is proceeding to discover a new approach to root disease control. This aims at discovering some soil organism which may produce a substance antagonistic to the growth of the root disease parasites. It might be possible to encourage growth of this organism in the neighbourhood of susceptible plants. This work entails extensive investigation into the soil microflora, isolation of possible antagonistic organisms and testing these organisms in culture.

The following year the Estate complains of death of trees that inspection has shown to be free from *Fomes lignosus*. Attack by *Coptotermes curvignathus* is found to be the cause, and as this white ant is the only termite known to be capable of attacking and killing living rubber it has been extensively studied. A second outbreak of dying trees, associated with neither termites nor root disease, is diagnosed as a case of lightning strike.

In the area budded with clone P.B. 86 the four year old trees are bleeding extensively and a visit is made. Although no pathogen is involved, injuries of this sort come within the Division's scope. It is found that severe wind has aggravated the normal tendency of P.B. 86 to exude latex, and that some of the wounds are infected. A special study of wound treatment has been made and the resulting recommendations given in Circular 32.

At six years the canopy has closed over, but there has been extensive dying of branches accompanied by bleeding and other symptoms of a severe attack of Pink Disease. Our observations have convinced us that this is a disease which calls for treatment. An effective procedure has been worked out and is presented in Circular 33.

When the tapping panels are opened, seven years after budding, there is an outbreak of Black Stripe which fortunately is quickly recognised and cured by application of a fungicide. Later a disease

OPENING OF TAPPING PANELS

appears, probably from the neighbouring kampong rubber, to which a great deal of fully successful research has been devoted. This is Mouldy Rot. The Division is responsible for testing proprietary fungicides submitted for inclusion in an officially approved list. It has been clearly demonstrated that this serious disease can be completely eradicated by treatment with the better of these fungicides, provided that they are regularly applied at suitably frequent intervals.

Every January, along with 1300 other estates in the country, Chendawan Lapok receives a copy of the circular on Secondary Leaf Fall, and as soon as the period of annual refoliation is over the manager collects samples of leaves from fields when the young leaf is falling. The tear off portion is returned to the R.R.I., and on the back of it we record the diagnosis: *Oidium, Gloeosporium,* Mites or Thrips, for each specimen. Several hundred specimens are examined by the Division each year, and provide the information which enables the course of the disease to be watched.

Chendawan Lapok has been fortunate; the young buddings have not tied themselves in knots, birds have refrained from pecking away the young bark, cyclones have spared the area, the trees have not been maliciously slashed. The Division has been faced with inquiries on all these and many other subjects over the past few years.

Even after the latex has left the tree the Division may still be concerned. Precoagulation may occur and the Chemical Division pass the latex over for a bacterial count, since the Pathology Division has the requisite equipment. There is spotting of sheet in the drying shed and there is a question as to whether the origin is fungal or not.

Finally a shipment goes to London; but samples are sent back with an inquiry as to whether the extensive mould which has developed is due to faulty packing or penetration of sea water during shipping. This type of inquiry too, falls within the province of the Pathological Division.

CALL FOR COOPERATION

The work of this Division, more than that of any other, depends on the cooperation of the planting community. Disease outbreaks are necessarily fortuitous, depending on an upsetting of the balance of nature. The chemist can vary the quantities of his reagents, the soil scientist can adjust the amounts and nature of the manures he applies, the botanist can test the effects of his improved selections by recording yields, but the plant pathologist must await for an exceptional combination of circumstances to produce the disease. He can rarely bring about these circumstances artificially, and when an outbreak does occur must seize the opportunity to gain as much information as he can.

Recognition of a New Leaf Disease

There are probably many minor diseases which have been present ever since rubber was first planted in Malaya, and although they are likely never to prove serious it is important to recognise them when they appear, and discover the organisms responsible. Such a disease is that described by Mr K.P. John in Communication 278 of the R.R.I. Journal. Mr John has established the cause of the disease by isolating a fungus in pure culture, reproducing typical spots on healthy leaves by artificial inoculation, and re-isolating the fungus. It is found to be a species of *Colletotrichum,* and is given a technical description. *Colletotrichum* is the name of a group of fungi containing many species attacking cultivated plants. Two have already been recorded on rubber, but the fungus now described differs from them in several respects.

Research on Bird's Eye Spot

The results of three years study of all aspects of this very widespread affliction of young plants is presented by Mr R.H. Hilton as Communication 280 of the R.R.I. Journal. Bird's Eye Spot has been known for many years in many countries and, although not fatal to the plants, has been recognised as causing considerable economic loss. The symptoms of the disease are described in detail, and it is shown how they differ according to the age of the leaf at the time when it becomes infected. The contrast between susceptible leaves growing in full sunlight and resistant leaves developed in shade is very striking, and has been closely investigated. The life history of the causal fungus, *Helminthosporium heveae,* has been worked out in detail and attention is drawn to its remarkable resistance to fungicidal control measures.

Personal

Mr H. J. Page, C.M.G., O.B.E., B.SC., who was Director of the Rubber Research Institute from 1936 to 1946, has resigned his appointment as Principal of the Imperial College of Tropical Agriculture at the end of October and is joining the staff of the Food and Agriculture Organisation of the United Nations. Readears will doubtless join the Staff of the Rubber Research Institute in wishing him every success in his new appointment.

Seed Gardens for Estates

At the present time the demand for clonal seed greatly exceeds the supply. It is likely that with the extensive replanting which is being carried out on the majority of rubber holdings this demand will continue.

The next issue of *Planters' Bulletin* will include an article on this subject, offering recommendations for the layout of simple and practicable seed gardens suitable for estates or for the larger smallholdings.

This article was to have appeared as Circular No. 38, had not this series been assimilated into the main body of the journal. Reference is thus made to it in Circular No. 37, 'Choice of Clones and Clonal Seedlings: Planting Recommendations for 1952-3'.

Suspected Bird Damage

IN MAY OF THIS YEAR we received from an estate in Kedah specimens showing a form of bark injury which was suspected of being the work of woodpeckers (*Figure 1*). We had not encountered anything like it in the last five years, but in *Diseases and Pests of the Rubber Tree* by A. Sharples (page 422) there is an illustration of a very similar injury attributed to squirrel damage. The trees being attacked were young and quite healthy, so it seemed on the face of it unlikely that an insectivorous bird like a woodpecker would have done this. Yet the planter was able to assure us that two watchmen set there for the purpose of observation saw a bird at work on a tree which next morning was found to have the characteristic injury with latex oozing from the cut surfaces.

Stimulated by this observation we searched our old records, and found two corroborative cases. The first, a photograph taken about 1927-8, showed the characteristic spiral injury to the bark and provisionally attributed it to birds. The second, in 1940, was a statement that woodpeckers were injuring two-year-old seedlings, but there was neither description nor photograph to identify the form of the damage.

Since then we have received reports from four other estates, three of them in the Klang district of Selangor, one from the Selangor - Negri Sembilan border. Everywhere the damage is the same. Only young trees (two to four years old) are attacked, bark being removed from the stem in a band about a quarter of an inch wide, usually in the form of a flat spiral. There may be many points of attack, as in *Figure 2* some quite recent, some already healed over.

Figure 1

One manager very kindly brought us a living specimen of the bird which his labourers were confident was the culprit. It was a female of the golden backed three toed woodpecker, *Dinopium javanense javanense*. We turned her loose in a large cage with a section of rubber stem to work on, and took the photograph reproduced in *Figure 3*. Unfortunately she survived only two days in spite of our ministrations and a supply of termites, which were eagerly consumed. During this time she pecked a few holes in the bark but, to our disappointment, did not execute the neat spiral cut which would have produced a conviction.

We have however, strong circumstantial evidence from another observant planter, who quite independently wrote to us about the same trouble on his estate. From the account given him by a field worker he decided that the bird responsible was a golden backed woodpecker, and although there are two such birds—the three toed and the four toed—it strengthens the case against *D. javanense*.

Figure 2

Figure 3

Why should there suddenly be an outbreak of this kind? The answer would seem to be in the observation that only young trees are attacked. The acreage of immature rubber has of course rapidly increased in the last year or two, and is still increasing. We should therefore expect the supposed bird damage to become more conspicuous, and it may be that further observation will enable us to be quite sure about its cause.

PATHOLOGICAL DIVISION

Remarkable Malady in Young Budded Rubber

EARLY THIS YEAR specimens were sent to us from an estate in central Perak showing a most unusual type of malformation. They were well grown two-year-old buddings of clone R.R.I. 501 in which a complete turn had taken place, as shown in *Figure 1*. This turn occurred in an otherwise straight stem about four feet from the ground; above it the stem grew straight up to the normal looking canopy some 10 feet high. The plants were healthy throughout, both in the normal and distorted portions. Further specimens were requested and when they arrived they were found to show a less developed stage of the malformation (*Figure 2*). Notice how there is a concentration of leaf bases in the distorted region. Such a concentration occurred in every case examined and shows the distortion to be associated with a slowing up of growth.

Figure 1. The first pair of specimens to be received, showing a complete turn. Note the swelling in the region of the turn, and the scars of broken off shoots.

Figure 2. A second pair of specimens sent in to show a more mild form of the trouble. Note the concentration of leaf base scars in the region of the bend.

Figure 3. A row of buddings in the field, all of which show the bending to a greater or lesser degree.

Figure 4. The most severely affected plant encountered in the field. It exhibits the extreme form of a complete loop.

APPEARANCE IN THE FIELD

As the trouble was reported to be widespread a visit was made to the area to investigate. Seen in the field it bore a most alarming aspect, many hundred plants being affected over an area of some forty acres. In places a dozen or more abnormal plants occurred adjacent to one another in the row (*Figure 3*) while elsewhere one or two abnormal plants occurred in a row of otherwise normal plants. Severity varied from a barely discernible bend (always near a concentration of leaf scars) to cases which had turned completely round, or bent sharply two or three times.

Closer examination revealed that the bark fissures in the region of the bend ran spirally round the stem, showing that the stem had been twisting at the same time as it had been turning. A useful analogy can be drawn with the kink that may be produced in a loose wire rope the ends of which are firmly fixed. The kink in a rope may be expanded to form a loop, and plants with a comparable formation were seen in the field (*Figure 4*).

The two adjacent fields affected are hedge planting, the buddings being six feet apart in the rows and the rows themselves thirty feet apart. The only unusual feature is a row of poisoned coconut palms down the centre of each avenue, this method of planting having been used for some years by the estate in its gradual change over from coconut to rubber. There was a certain amount of damage to the buddings from falling fronds, but no more than is usually expected with young plants growing under poisoned old rubber.

It is known that distortion of the shoots of young plants sometimes arises from contamination with hormone weed killers, or from mealybug attack. No hormone weed killers had been used in the area, but it is impossible to say whether or not the plants were attacked by mealybugs when young. Nor can one say whether such distortion arising from the attack of sucking insects on the green stems would persist in the woody stem. The problem is baffling. It can only be approached by continued observation of the affected plants and, above all, by examining any similar cases that may appear elsewhere.

CAUSE

Our object in publishing this is not only the inherent interest of this malformation, but in the hope that any reader who sees a similar twisting in budded rubber will let us know and so contribute to finding the answer. It would be very surprising if there are no other similar outbreaks in the thousands of acres of young buddings in the country.

REMEDY

What is the remedy? It is not a pleasant prospect to have to be prepared to cut back a well grown two year old clearing but the alternative is to have trees so distorted as to be untappable in eight years time. It might be possible to compromise by cutting the grosser malformations right back, cutting the others just below the abnormal position, and leaving the less severely affected trees as they are.

PATHOLOGICAL DIVISION

Discussion of Pests and Diseases at Bogor

A MOST SUCCESSFUL CONFERENCE of Rubber Research Institutes took place at Bogor in July of this year, at the joint invitation of the Centrale Proefstations Vereniging and the Indonesich Institut voor Rubberonderzoek. Malaya was represented by fourteen delegates including the Director and nine of the research staff of the R.R.I. In the section on Pests and Diseases there were six papers, four of them contributed by officers of the Pathological Division. The notes which follow give an idea of the subjects discussed; for a full report the reader must refer to the proceedings being published in the *Archief voor de Rubbercultuur.*

OIDIUM Dr H.E. Young, Director of the R.R.I. of Ceylon, discussed the *Oidium* problem in that country. His paper brought out very clearly the great importance of the disease there—a situation in marked contrast to its relative insignificance in Malaya. He mentioned that mildew was becoming more serious at low altitudes, where previously it has not been so troublesome, and pointed out how neglect of sulphur dusting can lead to almost continual refoliation and leaf fall. Attempts are being made to break the cycle by application of a defoliant, so timed that refoliation will occur during a season unfavourable to the fungus. As a long term project the R.R.I. of Ceylon is trying to breed for combined yield and resistance; meanwhile, protection against mildew is being provided by top budding high yielding trees with the resistant clone L.C.B. 870. The secondary leaf fall which takes place to a limited degree over most of Malaya is associated with other parasites (mites, *Gloeosporium,* and to a small extent thrips) as well as *Oidium,* but Dr Young has not found them to be important in Ceylon, although there are occasionally outbreaks of them in young rubber.

STOCK SCION INTERACTIONS Some results showing the effect of top budding with L.C.B. 870 on the yield of seedling trees were presented by Dr J.S. Vollema of the C.P.V. The conclusion drawn was that the depressing effect of the low yielding top clone extended between 100 and 150 cm below the union. Growth was not adversely affected, L.C.B. 870 bearing a vigorous crown. A lively discussion ensued on the nature of stock scion interactions. There were generally thought to be two mechanisms involved: (*a*) the effect on vigour—determining the amount of latex precursors produced, and (*b*) the influence of the latex system of the crown—when the cut was near enough for it to come within the 'drained' area.

LEAF DISEASES Mr R.N. Hilton, our Plant Pathologist, presented a resume of his fundamental studies of leaf diseases of rubber. Certain 'diseases' which had found their way into the literature were really only secondary infections of scorched or otherwise injured plants. Of the plant pathogens, he had studied Bird's Eye Spot (*Helminthosporium heveae*) in most detail; others dealt with were *Oidium heveae, Gloeosporium alborubrum* and two species of *Colletotrichum.* His observations were illustrated by a set of excellent leaf photographs taken by the Institute's artist and photographer, Mr. Hoh Choo Chuan. Among the conclusions drawn, the following are of particular interest: (*a*) that sun and shade leaves differ so much as to

be pathologically like two different plants; (*b*) the effect of age is such that no disease is common both in nurseries and in mature rubber, and (*c*) that there is evidence of an 'immune reaction' of seedlings to Bird's Eye Spot disease.

MOULDY ROT FUNGICIDES

Mr Hilton also presented a paper prepared by Mr F.W. Hutchison, our Field Research Officer, on the testing of Mouldy Rot fungicides. It was explained how the disease being a notifiable one made it imperative to have preparations of guaranted efficacy for its control, and the procedures now followed in testing them were described. Before a fungicide is recommended for approval it is submitted to laboratory tests, bark burning tests, and field trials under most exacting conditions. In addition to examining proprietary materials a search has been made to find more effective fungicides. The most promising are chemicals known as cationic soaps. One of these has already taken its place on the list of fungicides officially approved for the control of Mouldy Rot.

ROOT DISEASES

A second paper prepared by Mr Hutchison, dealing with our root disease experiments in relation to replanting, was presented by Dr A. Newsam. Although there is a danger that leaving stumps in the ground will greatly increase the cost of root disease control in a replanting, economic considerations have forced estates to rely on tree or stump poisoning with sodium arsenite as a method of clearing. It has become clear that the fungal parasite is not poisoned, but that the procedure exerts its effect by killing the stump quickly and so exposing it to invasion by harmless fungi. Data were presented to show how long the three most important root parasites can survive in small fragments of infected root buried in the soil, based on results obtained by Mr K.P. John, the Assistant Pathologist. These observations are of particular interest in connexion with the mechanical clearing of old rubber. Reference was made to a large scale composite experiment recently put down to observe the effect of three degrees of eradication of root disease in the old stand (complete, partial and no stumping) and various tree and stump treatments; and, in addition, to assess the value of two methods of disease control in the replanting as compared with no control measures—to answer the question whether or not root disease control pays.

ENTOMOLOGY

Dr Newsam then presented a paper on entomological problems. The termite *Coptotermes curvignathus* is undoubtedly the most important pest of rubber, in areas where jungle growths still remain; on smallholdings it is not very troublesome. Healthy trees are attacked, but diseased trees are particularly susceptible. Control measures in mature rubber do not destroy the pests, but by driving them away from attacked trees losses are minimised. Although no useful results had been obtained with newer chemicals, including synthetic insecticides, the positon is not serious in that the existing methods keep losses low. The urgent need is for a method of protecting newly planted stumps. Referring to cockchafers, the outbreak which built up in Malaya from 1930 to 1938 was described and discussed. The chafers came from the jungle, but it was not clear why,

nor what caused the decline which set in before the war and has continued so far that they are now rarely found. Finally mention was made of mites and thrips, both of which are usually controlled by their natural enemies, of which the most effective are their near relatives—other mites and thrips.

Perhaps the most valuable feature of a conference such as this is the chance it gives for an exchange of views between specialists working in different countries on related problems. It is to be hoped that there will be regular meetings of this sort at not too infrequent intervals.

PATHOLOGICAL DIVISION

Electric Fencing

THE PRINCIPLE OF ELECTRIC FENCING is that an insulated wire is intermittently charged to a voltage high enough to give a severe (but not fatal) shock to any animal touching it. The charging unit is supplied by an ordinary battery, like a car battery, which runs down very slowly because the current drain is negligible.

Extensive use has been made of electric fencing for the enclosure of domestic animals. They quickly learn to keep away from the fence, which therefore need not be made mechanically stronger than is necessary for supporting the wire, and herein lies its economy. Electric fences can also be used to exclude wild animals, and charging units are imported for this purpose by more than one agency house. Failures, however, have been reported, but the reason is usually that they have been improperly erected or maintained. We are therefore very glad to be able to print the following notes prepared by the Chief Game Warden of the Federation, Mr A.H. Featherstonhaugh, based on his experience from experiments extending back to 1937.

Electrified fencing has been proved efficient in many countries, and is used for control of elephants by the National Parks Board of Trustees in the Union of South Africa.

ERECTION Since the fence functions by producing an electric shock when touched, earthing of the live wire by anything other than the animal to be kept out destroys its effectiveness. It is recommended, therefore, that a rentis not less than six feet and preferably ten feet wide should be cleared outside the fence. This also minimises the chance of an animal blundering into it.

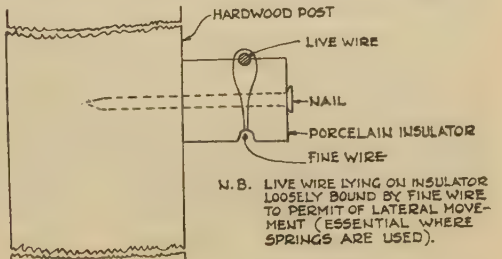
HARDWOOD POST
LIVE WIRE
NAIL
PORCELAIN INSULATOR
FINE WIRE
N.B. LIVE WIRE LYING ON INSULATOR LOOSELY BOUND BY FINE WIRE TO PERMIT OF LATERAL MOVEMENT (ESSENTIAL WHERE SPRINGS ARE USED).

Figure 1

As the fence depends upon the current passing through the live wire, there is no necessity for heavy posts; they should only be strong enough and of a class of timber hard enough to stand up for an

economic period. To withstand elephant they should be sufficiently firmly set in the ground to resist the pressure which can be exerted by a man leaning heavily against them.

Twelve gauge fencing wire is recommended, fixed to insulators securely nailed on the outside of the posts by the method illustrated in *Figure 1.*

ADAPTATION TO PARTICULAR CIRCUMSTANCES

An all purpose fence, as erected in the George V National Park, is shown diagramatically in *Figure 2* with recommended spacings of the three electrified wires. Here the ground is used as the earth return, and on moist soil this type of fence has proved itself against elephant, seladang, deer and wild pig.

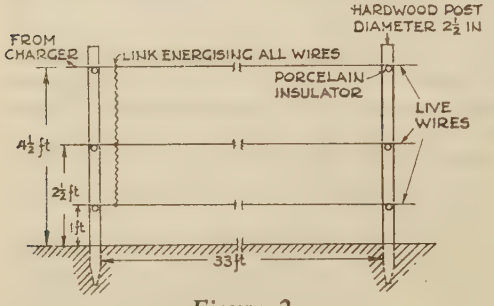

Figure 2

For protection against elephants alone, only the top live wire is needed. It is desirable to insert a coil spring in it every five chains or so in places where elephant have acquired a contempt for the fence (usually as a result of careless maintenance) and persistently charge through it.

On dry ground, where the animal will make a poor earth, an earth wire should be provided as shown in *Figure 3.* Every ten chains connection is made to a tin of water sunk in the ground, the tin having a small hole at the bottom through which water seeps out and so makes a good electrical contact.

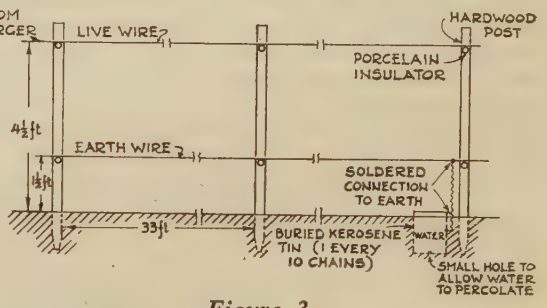

Figure 3

MAINTENANCE

The importance of proper maintenance cannot be overstressed. The fence should be patrolled by a reliable labourer as often as is practicable, preferably every day, and the following attended to. Branches which might earth the live wire should be lopped, fallen branches removed, and weeds growing near the fence slashed. The fence should be inspected for undue sagging in the wire, loose connections, broken or loose insulators, damaged springs, and posts requiring replacement. When water earths are in use, they should be topped up.

PATHOLOGICAL DIVISION

Despatch of Pathological Specimens to the R.R.I.

ADVISORY WORK of the Pathological Division is of necessity carried out largely by correspondence, because of the size of the area served and the need to deal with problems as they arise. The purpose of this note is to call the attention of managers to the ways in which they can make our task easier—by letting us have suitable specimens accompanied by full information.

Ideally, the aim of the collector of diseased material should be to secure a specimen showing the condition of maximum development, which will be after the plant tissues have been penetrated by the parasite but before decay from secondary organisms has set in. In practice it is best to send several specimens showing a range of symptoms. Diagnosis often entails making isolations of the parasite, and this is more easily done at an early stage of attack. Failure to isolate a pathogen from a well chosen specimen can be very informative, signifying that the disease is probably of non-parasitic origin. Isolation of one of the common saprophytes which invariably invade dead tissues rarely provides useful information as to the cause of death.

Symptoms may appear in one part of a plant when the disease is actually attacking another. Hence if it is impossible to send the whole plant it is important to confirm the health of the parts not sent. Particularly is this true of root diseases, which cause defoliation and die back of the shoots.

PACKING In order that plant specimens arrive in good condition at the laboratory it is necessary that care be taken in packing them. If they are too wet, bacteria and moulds which develop in transit may obscure the disease syptoms. Packed dry, the pathogenic fungi in the tissues will remain dormant long enough to reach us alive. We suggest that leaves and flowers be pressed between sheets of dry newspaper stiffened with cardboard; shoots and branches can be packed loose in cardboard boxes; panels are sufficiently protected by wrapping them in sacking; roots are best crated.

For most insect specimens the fifty pack cigarette tin is perfectly satisfactory. It should be ventilated by punching holes from the inside outwards, so that there are no sharp edges to damage the insects. Suitable food should be provided, and, for subterranean species, the tin filled with loosely packed moist (but not wet) soil. Large cockchafer grubs must not be more than one in a tin, or they will injure each other; if there are not enough tins, the grubs can be sent in a compartmented box. Tins should be wrapped or boxed to keep them cool on the journey. Whenever possible a generous number of specimens should be despatched, so that we have enough for rearing or preservation even though there have been losses in transit.

A similar article to the above appeared in the previous issue of Planters' Bulletin (P.B. 2, page 50), entitled Packing of Samples for Examination by Chemical Division.—Editor

It is helpful if all specimens are labelled to show their source and relation to each other; also, where a covering letter is not enclosed, there should be a reference to relevant correspondence. All packages should be addressed to the Director.

INFORMATION REQUIRED

Full details concerning the specimens are most important for an accurate diagnosis; and further particulars about the plantation are equally necessary for framing advice on control measures. Although it is not possible to lay down a schedule suitable for every case, the following is put forward as a guide to the sort of information required.

Planting details

Planting material—germinated seed, basket plants, stumps.
Details of clones.
Planting distances.
Dates of planting and budding.

Cultivation

Previous history—jungle, waste or cultivated land.
Covers—natural, leguminous, or none.
Weeding—strip, circle, spraying, slashing.
Thinning—poisoning or cutting.
Manurial treatments.

Local conditions

Soil type—peat, clay, loam, sand, laterite.
Situation, slope and drainage.
Weather conditions prior to the outbreak.
Possible predisposing factors—fires, flooding, storms.

Details of the outbreak

Symptoms described in some detail.
Area affected.
Number of proportion of plants affected, and whether in groups.
Control measures carried out.

If the above scheme is followed systematically it is unlikely that any essential details will be overlooked. So often letters contain information on only one or two of the subjects listed; then there is inevitable delay in prescribing treatment. Good specimens together with full information should lead to sound and prompt recommendations.

Reprints of this article may be obtained on request.

PATHOLOGICAL DIVISION

Keep your PBs

Prelimary pages, comprising a Title and a Contents list, are provided with this last issue of the year 1952. As only three issues of our New Series have appeared a full subject index is deferred to the end of 1953.

Once again, you are recommended to preserve your P Bs for reference. The series of numbered Circulars is discontinued; such material is now to be found in the *Planters' Bulletin*.

You will note we are avoiding volume numbers. Issue number—this P B 3—and page number are an adequate reference to any article. Page numbering will recommence at 1 in P B 4, the first issue of 1953.

Issues PB 1—3, for 1952, may now be stripped of their covers and bound with the preliminary pages supplied, or kept for binding with the full year 1953.

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